QPC: RJ20MTECH055 AR 19 Reg. No | | | | | | | | | | |

GIET UNIVERSITY, GUNUPUR – 765022

M. Tech (First Semester – Regular) Examinations, June – 2021

MPEMD1034 / MPEMT1041 - FATIGUE, CREEP & FRACTURE

(Common to Machine Design & Manufacturing Technology)

Time: 2 hrs Maximum: 50 Marks

The figures in the right hand margin indicate marks.

PART – A **(2 x 10 = 20 Marks)**

Q.1. Answer ***ALL*** questions

a. Comment on *notch strengthening* and *notch weakening*.

b. Does decarburization has any effect on fatigue strength of steel?

c. What are cyclic hardening and cyclic softening?

d. Differentiate: Low and high cycle fatigue

e. What is the effect of enhancing stress on creep behaviour of a material?

f. Fine grain materials are less creep resistant – comment with proper justification.

g. Give one example (with justification to your answer) of a material that creeps at room temperature.

h. What is Orowan's modification to the Griffith's theory of brittle fracture?

i. Differentiate: Ductile and brittle fracture.

j. Schematically draw a compact tension specimen (with all dimensions) for fracture toughness test.

PART – B **(6 x 5 = 30 Marks)**

Answer ***ANY FIVE*** questions		Marks
2.	Draw the S-N curves of mild steel and aluminium alloys and discuss about their nature. What is fatigue endurance limit?	4+2
3.	Discuss about the effect of stress concentration on fatigue strength of a material?	5
4.	A steel plate (containing a central crack of 0.2 mm in length that is oriented normal to the stress axis) is subjected to maximum and minimum stresses of 300 MPa and 10 MPa, respectively. Laboratory experiments have shown that this material experiences fatigue crack growth according to the relation: $da/dN = 4\times10^{-37}\ (\Delta K)^4$,where da/dN and ΔK are given in units of m/cycle and Pa-$m^{0.5}$. If the critical crack length is 8 mm, determine the number of cycles to failure.	6
5.	Discuss Nabarro-Herring and Coble creep.	6
6.	What is creep activation energy? How to calculate it?	2+4
7.	Neatly describe the plane strain fracture toughness test procedure for different materials.	6
8.	Derive an equation to accomplish the Griffith's theory of brittle fracture.	6

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